Table 2 and Figure 2 indicate that picture quality is improved significantly by removing some of the coding artifacts (e.g., "twinkle" in the stills), and by making the overall coding more efficient. This is observed in a variety of scenes chosen for Figure 5. The average score for differences in picture quality compared to the uncoded original is decreased by more than a factor of two compared to the ATTC-tested coder. Thus, the overall picture quality is increased by at least a factor of two.

Another significant improvement is the scene change behavior. Improvement in the deformatter hardware coupled with proper choice of the buffer control parameters has made almost all scene changes imperceptibly fast. Scene change "transients" are no longer visible.

The improved coder is now able to cope with source noise more efficiently. Vertical noise coring at the input to the coder and higher coding efficiency result in improvement of picture quality in the presence of source noise. As a measure of this improvement, coding of noise-added static and moving zone plates results in picture distortion that is about four times less in the improved coder than in the ATTC-tested coder.

The transmission performance is improved as well. The color stripe in co-channel interference from ATV into NTSC is gone. The peak-to-average power ratio is reduced by 1.5 dB by optimizing dispersion.

Thus, the overall conclusion is that the improvements are significant and dramatic. All of these improvements are made without using a lower number of binary segments (i.e., without using a higher bit rate for video) and therefore, the transmission performance is not sacrificed. Indeed, in many cases not only is the picture quality improved, but the number of binary segments is reduced overall.

4.1. Soft-Coding

DSC-HDTV transmits a constant number of symbols per second, but a fraction of symbols are transmitted with a 2-level signal and the remaining symbols are transmitted with a 4-level signal. Segments transmitted with a 2-level signal are more robust in the presence of transmission errors. However, if "X" 2-level segments are used, the total number of segments per frame time is (240 - X), resulting in reduction of the video data rate from

17.3 Mb/sec to ((240 - X) / 240) x 17.3 Mb/sec. Thus, a larger "X" implies a lower bit rate for video, but more robust transmission performance. The transmission performance also depends upon:

a) high coding efficiency, allowing usage of a larger number of 2-level segments,
b) amount and duty cycle of leak,
c) error concealment in the receiver and
d) which segments are selected for 2-level transmission

In the previous sections, we have described improvements a) through c). These are expected to give substantially better soft-coding performance than the ATTC-tested system. We are currently optimizing item d) above. After this is done, we will optimize the overall soft-coding performance by making the best possible trade-off between picture quality and transmission performance. This may slightly modify some of the picture quality measurements given in the previous tables.

5. Improvements for ACATS Field Testing

This section describes improvements that will be made before Field Testing.

5.1. Improvements to the Video Coder/Decoder

Spatially Adaptive Leak

Background

Normal scenes are coded well with the same leak value within a given frame. However, the coding of scenes that contain partial scene changes, extreme amounts of uncovered background or very high amplitude source noise, could be improved by adapting the amount of leak to scene content on a block-by-block basis within a frame.

Problem

The DSC-HDTV video coder currently is not able to change the leak value within a frame in the encoder. Variation of the leak is currently used in the decoder for error concealment only.

Solution

Spatially adaptive leak in the encoder requires modification to the following system components:

- Forward Analyzer
- Leak computation in the encoder loop
- Formatter
- Deformatter
- Leak computation in the decoder loop

The forward analyzer would compute the displaced frame difference (DFD) energy and the original frame energy for each block and decide which leak value to use in the encoder and decoder loops. The 1 bit per block of leak selection information would indicate whether to use the default leak value that is currently specified or to use a value at the other extreme. For example, if the default leak were 15/16, a set bit would indicate the use of a leak of zero (intra-frame coding). The leak selection bits would be spatially compressed and could be included in the channel data as an extension of the motion vector format. Since the current system sends some motion vector information per block even when motion compensation is not used, the use of the motion vector format for leak selection would generate little additional overhead.

Expected Improvement

Coding of scenes which contain partial scene changes; extreme amounts of uncovered background or very high amplitude source noise, will be significantly improved.

5.2. Improvements to the Transmission System

5.2.1. Adaptive Equalization on Data

Background

The DSC-HDTV system as delivered for ATTC testing utilized an adaptive equalizer which adapted only during the vertical sync reference every 1/60 sec. As in other digital transmission systems, the data in the DSC-HDTV system can also be used for adapting the equalizer.

Problem And Manifestation

The relatively slow update rate was imposed by time constraints to build the hardware. The slow update rate of the adaptive equalizer reduces the ability to track moving ghosts as might be encountered with airplane flutter.

Solution

A new adaptive equalizer is being designed which allows updating of the equalizer based on data. This will require modifying two boards in the DSC-HDTV receiver. The impact of this change on the receiver cost will not be significant to the conclusions reached by SS/WP3.

Expected Improvement

A faster update rate for the adaptive equalizer will improve the system's ability to track moving ghosts.

6. Improvements After Field Testing

A number of improvements to the DSC-HDTV system will continue to be made after field testing. These will exploit new advances in compression and transmission technology in an upward compatible way.

6.1. Improvements to the Video Coder/Decoder

The following parameters and system components can continue to be optimized after the HDTV standard is set:

- Perceptual thresholds
- Coefficient scaling for quantization
- Buffer control
- Motion estimation
- Adaptive motion vector budget
- Quantizer vector selection
- Leak adaptation
- Adaptive source filtering
- Robust segment selection algorithm

All of these are encoder modifications that can continue even after the HDTV service is established.

7. Audio and Ancillary Data Features

Introduction

In order to provide more recent desirable services and features such as those identified in ATSC document T3/186 dated 2/3/92 and to provide a variable assignment within the terrestrial broadcasting bi-rate/space by using headers and descriptors,* a flexible assignment scheme is described.

* This is described in the SMPTE Header/Descriptor Task Force: Final Report, published in the SMPTE Journal, June, 1992

The DSC-HDTV Audio and Ancillary Data Format Previously Certified by SS/WP-1

The DSC-HDTV System was certified by SS/WP-1 with the following fixed allocations for audio and ancillary data:

1. Audio (stereo) pair on 2-level signalling - 251,748 b/s.
2. Audio (stereo) pair on 4-level signaling - 251,748 b/s.
3. Ancillary Data (application undefined) on 2-level signaling - 30,210 b/s.
4. Ancillary Data (application undefined) on 4-level signaling - 382,657 b/s.

Headers/Descriptors

The newly proposed use of headers/descriptors allows for flexible assignment of audio data, video data, and ancillary data.

Reorganization of the DSC-HDTV Data Frame

In the terrestrial broadcasting application, the HDTV signal must survive a multiplicity of interferences and degradations. In the DSC-HDTV system the recovery of synchronizing information is given highest priority by making the data field sync and data segment sync information periodic for the greatest ruggedness. The data synchronizing information can be considered an implicit header with fixed, defined periodicity. The Data Field Sync and the Data Segment Sync locations in the Data Frame are shown in the example of Figures 6 and 7.

Immediately following the Data Field Sync Segment is the Header and Descriptor Segment (2-level) which is error protected with (167, 147) T = 10 Reed-Solomon Code. The data with which the Headers are associated are deliberately not positioned immediately following in sequence because of the finite total number of available bits. This provides a more economical use of the available bits.

Header/Descriptor Segment

Data: 147 Bytes

Allocation

1. 16 Header Words, 8 Bytes Each:
   - Service and Descriptor, 2 bytes (16 bits);
   - Packet Number, 2 bytes;
   - Packet Length, 2 bytes;
   - Counter, 2 bytes.

2. Transmission Bit Map (TBM), 17 Bytes:
   - TBM, 16 bytes + 1 bit;
   - Reserved, 7 bits.

Header Details

Four primary data services.

1. Video Data
   - DSC-HDTV compressed video
   - Other video

2. Audio Data
   - Surround Sound Audio
   - Second Language Audio
   - Descriptive Video Dialog
   - Audio for Hearing Impaired
   - Audio Expander Control
   - Other Audio

3. Ancillary Data
   - Closed Captioning
   - Teletext
   - Program Guide
   - Conditional Access, Encryption Keys
   - Program Mode Control
   - Other Data

4. Control Data
   - Data Field and Segment Synchronization
   - Test Data for System Measurement
   - Error Correction Parity
   - Headers and Descriptors
   - TBM for Bi-rate Transmission

A specific "Scenario 1" is shown in Table 3.

Header & Descriptor Scenario 1

	Segments/Field	Usable Bytes/Field	Bytes/Field	Bits/Field	Bits/Sec
Video Data (2L)	47		13818	55272	3313006.99
Video Data (4L)	148		21756	174048	10432447.55
Sub Total of Video Data Bytes		28665	35574		
(16) Headers & TBM (2L)**		145	290	1160	69530.47
Program Audio (2L)		690	1380	5520	330869.13
4 (26 Bit) Public Keys (2L)		13	26	104	6233.77
Closed Captioning		20	40	160	9590.41
Audio Expander (2L)		14	28	112	6713.29
Sub Total (2L) Bytes		882	1764		
(2L) Segments Used	6				
2nd Language (4L)			525	4200	251748.25
Descriptive Video (4L)			133	1064	63776.22
Special Audio			133	1064	63776.22
Program Guide			5	40	2397.60
Teletext (4L)			70	560	33566.43
Subscriber Authorization (4L)			163	1304	78161.84
Sub Total (4L) Bytes			1029		
(4L) Segments Used	7				
Actual Data Used			38367	230480	14661818.17
Error Protection Data, Max Possible			38367	306936	18397762.24

2 Level Segments	4 Level Segments	Total Segments
106	155	261

** Only 13 Headers used in example
TBM = Transmission Bit Map for Bi-Rate System
(2L) = 2 Level Transmission
(4L) = 4 Level Transmission

Table 3

When Service Data is combined with Headers, Error Correction Parity, and Synchronizing, the total Data Transport Format is formed as shown in Table 4.

HDTV Data Transport Format

FRM = 33.36 ms	Seg/Frm	Byte/Seg	Byte/Frm	% of data
Header Field 1	2	147	294	0.33
Data Field 1	259	147	38073	42.41
RS Parity Field 1	261	20	5220	5.81
Header Field 2	2	147	294	0.33
Data Field 2	259	147	38073	42.41
RS Parity Field 2	261	20	5220	5.81
Data Field Sync	2	167	334	0.37
Test Seg	1	167	167	0.19
Data Segment Sync	525	4	2100	2.34
DSC-HDTV Data Frame	525	171	89775	100 *

* Corresponds to 21,524,425.52 bits/sec.

Table 4

A total Data Frame corresponding to the "Scenario 1" is shown in Figures 6 and 7.

171 Bytes/63.5uSec

4 x 262 = 1,048 Data Segments Sync

Data	Parity	Segment
167 Data Field Sync (Equalizer Taining)		1
13 (8 Byte) Headers / 17 TBM / 10 Cap. / 13 Keys / 3 Exp.	20 Parity	2
		3
45 Expander / 102 Program Audio	20 Parity	4
		5
147 Program Audio	20 Parity	6
		7
147 Program Audio	20 Parity	8
		9
147 Program Audio	20 Parity	10
		11
147 Program Audio	20 Parity	12
		13
147 Video Global	20 Parity	14
Video Data (MIN) 120 x 147 = 17,640 If all sent W1 (MAX) 240 x 147 = 35,280 If all sent W2	2,400 Parity or 4,800 Parity	255
147 2nd Language	20 Parity	256
53 2nd Language / 70 Teletext / 5 Prog Gd / 19 DV	20 Parity	257
114 DV / 33 Spec Audio	20 Parity	258
100 Spec Audio / 47 Cond Access	20 Parity	259
147 Conditional Access	20 Parity	260
147 Conditional Access	20 Parity	261
147 Conditional Access	20 Parity	262

Figure 6. Header & Descriptor Scenario 1, Bi-Rate Data Format - Data Field 1

171 Bytes/63.5uSec

263 x 4 = 1,052 Data Segments Sync

Data	Parity	Segment
167 Data Field Sync (Equalizer Taining)		263
13 (8 Byte) Headers / 17 TBM / 10 Cap. / 13 Keys / 3 Exp.	20 Parity	264
		265
45 Expander / 102 Program Audio	20 Parity	266
		267
147 Program Audio	20 Parity	268
		269
147 Program Audio	20 Parity	270
		271
147 Program Audio	20 Parity	272
		273
147 Program Audio	20 Parity	274
		275
147 Video Global	20 Parity	276
Video Data (MIN) 120 x 147 = 17,640 If all sent W1 (MAX) 240 x 147 = 35,280 If all sent W2	2,400 Parity or 4,800 Parity	517
147 2nd Language	20 Parity	518
53 2nd Language / 70 Teletext / 5 Prog Gd / 19 DV	20 Parity	519
114 DV / 33 Spec Audio	20 Parity	520
100 Spec Audio / 47 Cond Access	20 Parity	521
147 Conditional Access	20 Parity	522
147 Conditional Access	20 Parity	523
147 Conditional Access	20 Parity	524
167 Test Data		525

Figure 7. Header & Descriptor Scenario 1, Bi-Rate Data Format - Data Field 2

Conditional Access/Encryption

In "Scenario 1" Table 3, data space is allowed for four (26 bit) Public Keys on the most rugged signaling waveform (i.e., 2-level) and accompanying data space for Subscriber Authorization/Addressing on the normal signaling waveform (i.e., 4-level) for pay-per-view. A subscriber universe of 1.8 billion units may be addressed. An extreme mode of the system in which the majority of data is defined by the headers to be addressing and subscriber control data would allow addressing more than 5.7 million subscribers per minute. During this time, other ancillary data would be suppressed and a minimum quality audio/video service would be maintained. The use of headers allows addressing performance to be traded temporarily for program quality.

Compatibility With Packet Networks

The DSC-symbols are organized in data segments that resemble packets, and the data segments are organized into data frames of duration 1/29.97 sec. In order to carry the DSC-HDTV signals on an ATM (Asynchronous Transfer Mode) network, for example, the data in data frames would be encapsulated in the ATM cell structure, which might then be embedded in a SONET transmission system. The number of bits within a data frame will vary, since some segments are 2-level (W1) and some are 4-level (W2). It is advantageous to generate a constant bit-rate for network transmission. This could be done by repeating the W1 segments which would also provide more robustness for W1 segments. The transmission bit map (TBM) contained within the data frame indicates which data segments are 2-level.

Conclusion

The newly proposed use of headers/descriptors as described in the SMPTE Header/Descriptor Task Force: Final Report, has been shown above with a specific example (Scenario 1) which includes the audio and ancillary data services and features described in the ATSC document T3/186.

8. Supplementary Testing

In order to quantify reliably the improvements to the DSC-HDTV system described here, we believe that only a relatively small portion of the full set of Advisory Committee tests is required. It must be recognized that the DSC-HDTV system has already been fully tested, and that the Advisory Committee's goal is not full re-testing, but qualification of improvements and verification of performance, insuring that all changes are fully documented and all implications and trade-offs are understood. Although full re-testing could achieve this goal, it is neither necessary nor efficient. Supplemental testing should strive for minimum but fully adequate testing with intelligent targeting of selected areas to. be tested based on the improvements and changes proposed.

In addition, supplemental testing should be streamlined by modifying the test procedures. Through the testing experience at the ATTC, it became clear that the procedures, originally written for analog systems, were needlessly time-consuming for digital systems. An example is the voting process for finding the Threshold of Visibility (TOV) and the Point of Usability (POU). During the DSC-HDTV re-testing due to "stuck bits", more than twenty TOVs and POUs were confirmed within a fraction of a dB in just a few hours. The streamlining proved to be very effective and accurate.

For supplemental testing, all the Advisory Committee tests can be classified into three categories:

1. Tests which are unnecessary because:
   - Results will not substantially change
   - Effects of improvements and implications are adequately documented via other tests
   - Although improved results are expected, previous test data demonstrate adequate performance
2. Tests which are necessary because:
   - They document improvement
   - They document other implications and trade-offs of improvements
   - They are not expected to change substantially but need to be spot-checked
3. Tests which are desirable but not necessary because:
   - They only provide additional or supporting information

To help the Technical Subgroup or other Advisory Committee groups determine exactly which supplemental tests should be conducted, the following four tables are included:

- Table 5 lists those tests which we believe are necessary for supplemental testing, the improvements to be measured, and an estimate of the time required for ATTC to complete the tests.
- Table 6 lists those tests which we believe are unnecessary, but desirable.
- Table 7 lists those tests which we believe are unnecessary for supplemental testing, and the reasons why.
- Table 8 summarizes the improvements and the corresponding tests to measure them, including tests to evaluate trade-offs and possible impacts on other aspects of performance.

The careful analysis depicted in these tables indicates that fully adequate supplemental testing of the DSC-HDTV system could be accomplished in about three days of testing at the ATTC. Given the increased experience of proponents and test center personnel, we believe a full supplementary testing program can be accomplished for the DSC-HDTV system in one calendar week.

Necessary Tests	Improvement Being Tested	Estimated ATTC Time (hours)
Basic Video Quality*	VC, SV, QWSV, BC, DE	2
Random Noise: TOV, POU and Ranging*	RSA, PL	2
Co-channel(Moderate Level): TOV, POU and Ranging*		4
N into A	RSA, PL	
A into A	RSA, PL	
A into N	FO, DISP	
Digital Specific and System Specific		10
Free Form Viewing	SV, QWSV	
Scene Cuts	BC, DE, QWSV	
Video Coder Overload - Flash Cuts Only	BC, DE, QWSV	
Zone Plate (Added to Free Form Viewing)	LO, SV, QWSV	
Source Noise	VC, SV, QWSV	
Multiple Impairment: Co-channel (N into A) & Noise	PL	
Upper Adjacent A-into-N TOV	PL	0.5
Concatenation	SV, QWSV	1
Peak-to-Average Ratio	DISP	4

Note: Determination of TOV, POU, & ranging should use a streamlined procedure with expert viewers similar to what was done during System Specific testing.

* Requires ATEL Testing.

Key:

VC = Vertical Noise Coring

SV = Additional Selection Vectors

QWSV = Proper Selection of Quantizers, Perceptual Weights, Scale Factors, and VLCs

LO = Leak Offset

BC = Proper Buffer Control Parameters

DE = Improved Deformatter Efficiency

RSA = Proper Parameter Settings For Robust Segment Selection Algorithm

FO = Frequency Offset

DISP = Dispersion

PL = Pilot Level

Table 5. Necessary Supplemental Tests

Desirable But Not Necessary Tests	Improvement Being Tested	Estimated ATTC Time (hours)
Digital-Specific and System-Specific	Proper Parameter Settings For Robust Segment Selection Algorithm.	5
Picture Disturbance Characteristics Due to Errors		
Time Varying Channel Impairment		
Threshold Characteristics		
Film Mode		

Table 6. Desirable Supplemental Tests

Unnecessary Test	Reason
UHF Taboo Tests	Improvement Expected Due to Lower Pilot and Lower Peak-to-Average; Previous Performance Fully Adequate
Audio	No change
Degradation of BTSC Audio and Ancillary VBI Services	Small Improvement But No Significant Change Expected
Image Resolution	EO&C From Free Form Viewing Adequate
Luma Temporal Response	EO&C From Scene Cuts Adequate
Chromaticity/Colorimetry Characteristics	No Change
Confirmation of Provisions for Ancillary Data	No Change
Susceptibility to Multipath and Airplane Flutter	No Change
Lower Adjacent A/N; N/A; A/A	No Change
Discrete Freq. Interference	No Change
Impulse Noise	No Change
Co-channel (Weak)	Co-channel (Moderate Level) is Adequate
All Cable Labs Tests Except Channel Change and Acquisition Time in Presence of Noise and Echoes	No Change in TOVs
Channel Change and Acquisition Time in Presence of Noise and Echoes	Time to Recognizable Picture is Improved But No Testing Required.
Motion Comp. Overload	No Change, There Were PIXAR Problems During Original Tests
Transient Response to Sudden Stop	No Change
Mixed Adjacencies	Adequately Covered by Flash Cuts and Scene Cuts
Noise and Selected Adjacent NTSC Channel Into ATV	No Change

Table 7. Unnecessary Supplemental Tests

Fixed Problem	Solution To Problem	Tests to Quantify Improvement	Tests to Evaluate Other Implications and Trade-offs
Twinkle in stills	Additional selection vectors	Basic Video Quality	Concatenation, Free Form Viewing, Random Noise, Co-channel N/A & A/A
Block artifacts in zone plates	Additional selection vectors	Free Form Viewing of zone plate	Source Noise, Concatenation, Basic Video Quality, Random Noise, Co-channel N/A & A/A
Breathing in zone plate	Leak offset instead of mean offset	Free Form Viewing of zone plate	Source Noise, Concatenation, Basic Video Quality, Random Noise, Co-channel N/A
Visible quantization error in saturated colors	Proper quantizers, perceptual weights, scale factors, and VLCs	Basic Video Quality	Free Form Viewing, Source Noise, Concatenation, Random Noise, Co-channel N/A
Slow scene changes	Better buffer control parameters, increased deformatter speed	Scene Cuts	Free Form Viewing, Flash Cuts, Random Noise, Co-channel N/A
Fading to gray during heavy channel impairments	No leak during errors	Random Noise, Co-channel N/A & A/A	Threshold Characteristics, Picture Disturbance Characteristics due to Errors, Time Varying Channel Impairments, Basic Video Quality
Inadequate use of robust transmission for motion scenes	Better selection of 2-level data	Random Noise, Co-channel N/A	Threshold Characteristics, Picture Disturbance Characteristics due to Errors, Time Varying Channel Impairments, Basic Video Quality
Visible coding artifacts in complex scenes with source noise	Additional selection vectors	Basic Video Quality, Source Noise	Concatenation, Free Form Viewing, Random Noise, Co-channel N/A & A/A
Unnecessary interference into lower NTSC channel	Lower pilot	Upper Adjacent A/N	Random Noise, Co-channel N/A & A/A
Unnecessary peak-to-average	Reoptimize dispersion	Peak-To-Average Power Ratio	Co-channel A/N
Visible color stripe into NTSC co-channel	Additional 30 Hz offset	Co-channel A/N	Co-channel N/A

Table 8. Improvements And Corresponding Tests

9. Summary And Conclusions

Through more careful tuning and a series of relatively modest improvements, the overall performance of the DSC-HDTV system has been enhanced significantly. Highlights of this improved performance include:

- The complete removal of a variety of coding artifacts
- Improvement in overall picture quality by more than a factor of two in terms of quality difference relative to an uncoded reference
- Significantly increased robustness to source noise
- Imperceptibly fast scene changes
- Better error concealment
- Elimination of faint color stripes in ATV into NTSC co-channel interference
- Significantly improved soft-coding performance
- Reduction of peak-to-average power ratio

All of these improvements have been accomplished without making any fundamental changes in the DSC-HDTV algorithms or system as certified by SS-WP1. They also have not come at the expense of transmission coverage or any other aspects of system performance. Indeed, we expect the improvements in video coding efficiency to yield significantly better soft-coding performance.

A manageable set of supplemental tests has been proposed which will permit the Advisory Committee to obtain a quantified measure of the improvements to the DSC-HDTV system. We believe this can also be done for improvements the other proponents may ask the Technical Subgroup of the Special Panel to consider. Conducting such tests will help ensure that the Advisory Committee bases its recommendation to the FCC on the most up-to-date, complete and reliable information possible, and ultimately will help guarantee that the nation is given the best possible HDTV system for the decades to come.

APPENDIX

Other Improvements Under Way

A.1. Two DSC-HDTV Programs in One 6 MHz Cable Channel

Cable TV operational requirements are significantly different from those for terrestrial broadcast. The signal-to-noise ratio in a 6 MHz channel is always greater than 35 dB. Other interferers are controlled to an even lower level. This means the digital RF modems designed for terrestrial broadcast, operating on a cable plant, have a considerable noise margin. This excess margin can be used to increase the data rate significantly. In the DSC-HDTV system, carrier recovery and all data synchronization are accomplished by using auxiliary signals. Because these systems are very accurate and robust, the system can support a larger constellation without any changes. On a modern cable plant, this same hardware could be used to receive a large constellation such as 16-VSB. The data rate would be 43 Mb/sec, precisely twice that used for terrestrial broadcast. This would allow two complete high definition signals to be carried over one 6 MHz channel on cable. The system would require a signal-to-noise-plus-interference ratio greater than 32 dB, well within the capability of modern cable plants. The micro-reflections found in such cable systems are easily within the capabilities of the DSC-HDTV adaptive equalizer.

Among other advantages, the ability to carry two high definition signals in one cable channel would go far toward alleviating any problems that cable systems might have in carrying the additional high definition terrestrial broadcast channels.

Prototype hardware implementing the 16-VSB (43 Mb/sec) modulation scheme has been constructed. It is currently demonstrable with data only, but work is progressing to interface two completely independent 21.5 Mb/sec DSC-HDTV compressed data streams to be able to demonstrate two high definition programs in a single 6 MHz cable.

A.2. DSC-HDTV Consumer VCR

The certification document for DSC-HDTV presented to SS/WP-1 noted that the compressed data signal could be recorded and played back using Super-VHS technology. Experimental units have now been developed using S-VHS tape (0.5 inch) and S-VHS heads with modified transport.

The recorded signal is a 21.5 Mb/sec data stream derived from the HDTV receiver after Reed-Solomon error correction of transmission errors. Upon playback, the recovered 21.5 Mb/sec data stream is fed once again through the Reed-Solomon decoder to correct errors related to the HD-VCR tape medium.

The error-corrected played-back data stream is then demultiplexed into the video, audio, and ancillary data streams within the HDTV receiver for subsequent decoding.

The viability of VCR recording of DSC-HDTV has thus been demonstrated.